

## WHAT IS CLAIMED IS:

*sub a1* 1. A method for treating cancer, comprising:  
detecting a tumor in a patient; and  
applying mechanical pressure waves to said tumor at a mechanical resonance frequency of said tumor to effectively destroy said tumor.

2. The method defined in claim 1, further comprising determining said mechanical resonance frequency, the determining of said mechanical resonance frequency including:  
generating a series of investigatory pressure waves of respective different preselected frequencies in a patient so that said investigatory pressure waves are transmitted to said tumor through overlying tissues;

during the generating of said investigatory pressure waves in the patient, monitoring responsive oscillatory motion of said tumor and at least some internal tissues of the patient proximate to the tumor, said responsive oscillatory motion arising as a result of the transmission of said investigatory pressure waves into the patient; and

determining said mechanical resonance frequency from the responsive oscillatory motion of said tumor and said internal tissues, said mechanical resonance frequency being a pressure wave frequency which results in a resonant loading of said tumor and essentially leaves said internal tissues undamaged.

3. The method defined in claim 2 wherein the applying of the mechanical pressure waves

to said tumor includes generating, in the patient, treatment pressure waves of said mechanical resonance frequency and of an effective amplitude so that said tumor resonates with sufficient energy to mechanically destroy said tumor.

4. The method defined in claim 3 wherein the generating of said investigatory pressure waves includes placing a substrate in contact with an external surface of the patient, said substrate carrying a plurality of electromechanical transducers, and further includes energizing said transducers with periodic voltages of said different preselected frequencies.

5. The method defined in claim 4 wherein the energizing of said transducers includes energizing each of said transducers with voltages of a plurality of different frequencies, the monitoring of responsive oscillatory motion of said tumor and at least some internal tissues of the patient proximate to the tumor including monitoring responsive oscillatory motion of said tumor and said internal tissues proximate to said tumor for each of said transducers and each of the frequencies with which the respective transducers are energized.

6. The method defined in claim 5 wherein the patient has skin surfaces in different planes and wherein the placing of said substrate in contact with an external surface of the patient includes positioning at least one of said transducers in pressure-wave transmitting contact with each of said skin surfaces.

7. The method defined in claim 5 wherein the generating of said treatment pressure waves includes energizing at least one of said transducers with a periodic voltage of said determined pressure wave frequency.

8. The method defined in claim 4 wherein the patient has skin surfaces in different planes and wherein the placing of said substrate in contact with an external surface of the patient includes positioning at least one of said transducers in pressure-wave transmitting contact with each of said skin surfaces.

9. The method defined in claim 2 wherein the monitoring of motion of said tumor and said internal tissues includes:

sensing pressure waves generated at a skin surface of the patient in response to motion of said tumor and said internal tissues; and

processing said pressure waves to determine said responsive oscillatory motion of said tumor.

10. The method defined in claim 9 wherein the processing of said pressure waves includes analyzing said pressure waves to determine three-dimensional shapes of internal tissue structures including said tumor and to determine modes and magnitudes of motions of said internal tissues structures.

11. The method defined in claim 3 wherein the generating of said treatment pressure waves includes placing an electromechanical transducer in contact with an external surface of the patient and energizing said transducer with a periodic voltage of said mechanical resonance frequency.

12. The method defined in claim 3 wherein the generating of said treatment pressure waves includes placing a substrate in contact with an external surface of the patient, said substrate carrying plurality of electromechanical transducers, and further includes energizing said transducers with a periodic voltage of said mechanical resonance frequency.

13. The method defined in claim 2 wherein the generating of said investigatory pressure waves includes placing an electromechanical transducer in contact with an external surface of the patient and energizing said transducer with periodic voltages of said different preselected frequencies.

14. The method defined in claim 2 wherein the monitoring of motion of said tumor and said internal tissues includes:

providing a multiplicity of probes each having sensors for determining motion;

inserting said probes into the patient; and

monitoring signal outputs of said sensors to determine motion of surfaces or boundaries of said tumor and said internal tissues.

15. The method defined in claim 1 wherein the applying of said said mechanical pressure waves to said tumor includes transmitting said mechanical pressure wave through overlying tissues of the patient.

16. The method defined in claim 1 wherein the applying of said said mechanical pressure waves to said tumor includes disposing at least one transducer in the patient and energizing said transducer to generate said mechanical pressure waves.

17. A medical treatment system comprising:

a carrier;

a plurality of electromechanical transducers mounted to said carrier;

an a-c current generator operatively connected to at least some of said transducers for energizing said transducers with electrical signals of a plurality of pre-established frequencies to produce first pressure waves in the patient; and

an acoustic signal processor operatively connected to at least some of said transducers programmed to analyze incoming pressure waves to determine mechanical resonant characteristics of internal tissue structures of a patient, said incoming pressure waves being generated by said internal tissue structures in response to said first pressure waves, said processor being programmed more particularly to determine which of said transducers is to be energized with which of said frequencies to resonantly overload a predetermined one of said tissue structures, thereby mechanically destroying said one of said tissue structures.

18. The system defined in claim 17, further comprising means operatively connected to said processor for identifying said one of said tissue structures.

19. The system defined in claim 18 wherein said means for identifying includes:

at least one electroacoustic transducer mounted to said carrier for producing primary ultrasonic pressure waves in the patient;

at least one acoustoelectric transducer mounted to said carrier for sensing secondary ultrasonic pressure waves produced at said internal tissue structures in response to said primary pressure waves; and

an ultrasonic wave analyzer operatively connected to said acoustoelectric transducer for determining three-dimensional shapes of said internal tissue structures of the patient by analyzing signals generated by said acoustoelectric transducer in response to said secondary pressure waves.

20. The system defined in claim 19 wherein said electroacoustic transducer is one of said electromechanical transducers and wherein said acoustoelectric transducer is one of said electromechanical transducers.

21. The system defined in claim 19 wherein said carrier includes a flexible web conformable to the patient.

22. The system defined in claim 19, further comprising a video monitor linked to said analyzer for displaying an image of said internal tissue structures.

23. A method for performing a medical operation, comprising:

placing a plurality of electromechanical transducers in pressure-wave-transmitting contact with a patient;

energizing at least some of said transducers with an ultrasonic frequency to produce ultrasonic first pressure waves in the patient;

energizing at least one of said transducers with another frequency in a range below ultrasonic to produce second pressure waves in the patient; and

analyzing ultrasonic third pressure waves produced at internal tissue structures of the patient in response to said first pressure waves to determine three dimensional shapes of said tissue structures and to monitor resonant motion of said tissue structures in response to said second pressure waves.

24. The method defined in claims 23 wherein said one of said transducers is energized *in seriatim* with a plurality of test frequencies in said range below ultrasonic, said another frequency being one of said test frequencies, the analyzing of said third pressure waves including determining whether any of said test frequencies results in a resonant loading of a predetermined one of said tissue structures.

25. The method defined in claims 23, further comprising, upon determining that one of said test frequencies is a resonant frequency of said predetermined one of said tissue structures, energizing said transducer with said one of said test frequencies to destroy said predetermined one of said tissue structures.

26. The method defined in claims 23 wherein said transducers are all attached to a single flexible substrate, the placing of said transducers in pressure-wave-transmitting contact with the patient including conforming at least a portion of said substrate to the patient.

27. The method defined in claims 23, further comprising energizing a plurality of said transducers *in seriatim* with a plurality of test frequencies in said range below ultrasonic, the analyzing of said third pressure waves including identifying which of said transducers and which of said test frequencies, if any, induce a resonant loading of said predetermined one of said tissue structures.

28. The method defined in claims 23 wherein the analyzing of said third pressure waves to monitor resonant motion of said tissue structures in response to said second pressure waves includes automatically comparing sizes and shapes of said tissue structures at a succession of times to determine changes in sizes and shapes of said tissue structures.